UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Prevention, Pesticides, and Toxic Substances
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MEMORANDUM

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SUBJECT: Revised Tier II Surface Drinking Water Assessment for Human Health Risk for Ziram

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The Environmental Fate and Effects Division (EFED) has been asked to provide a revised water assessment for ziram in response to an earlier Tier II assessment of drinking water using surrogate Wisconsin Cherry/Stone Fruits Scenario for western stone fruits. EFED conducted a revised Tier II evaluation using recently developed western stone fruits scenario to amend the surface drinking water assessment for ziram. The PRZM/EXAMS model was applied to estimate the ziram concentrations in an index reservoir using dormant application rate (7.5 lbs ai/acre/2

applications/60 days retreatment) and crop cycle application rate (6.08 lbs ai/acre/7 applications/3 days retreatment). For surface water, the results are summarized in the following table.

Table 1: Drinking water concentrations for western Stone Fruits.

Scenarios	Acute (peak)	Non-cancer Chronic (annual)	Cancer chronic (Mean 36-year annual)
	Concentration (: g L^{-1})		
Western tone fruit (crop cycle)	98.31	1.98	1.76
Western stone fruit (dormant)	49.67	0.54	0.45

Note: : g L^{-1} = ppb

1.0 Estimation of surface water exposure concentrations

The maximum application rate and relevent environmental fate parameters for ziram were used in the Tier II model (PRZM/EXAMS) for EDWCs in the surface water. The outputs of the screening model represent upper-bound estimate of the concentration that might be found in surface water due to use of Ziram on western stone fruits.

2.0 Background Information on PRZM/EXAMS simulation

PRZM/EXAMS modeling using the Index Reservoir (IR) and the Percent Crop Area (PCA) adjustment was used to estimate concentrations in surface water used as a source of drinking water. The index reservoir represents a watershed that is more vulnerable than most used as drinking water sources. It was developed from a real watershed in western Illinois. The index reservoir is used as a standard watershed that is combined with local soils, weather, and cropping practices to represent a vulnerable watershed for each crop that could support a drinking water supply. If a community derives its drinking water from a large river, the estimated exposure would likely be higher than the actual exposure. Conversely, a community that derives its drinking water from smaller bodies of water with minimal outflow would likely get higher drinking water exposure than estimated using the index reservoir. Areas with a more humid climate that use a similar reservoir and cropping patterns would likely get more pesticides in their drinking water than predicted levels.

A single steady flow has been used to represent the flow through the reservoir. Discharge from the reservoir also removes chemical from it so this assumption will underestimate removal from the reservoir during wet periods and overestimates removal during dry periods. This assumption can both underestimate or overestimate the concentration in the reservoir depending upon the annual precipitation pattern at the site. The index reservoir scenario uses the characteristic

of a single soil to represent all soils in the basin. Soils can vary substantially across even small areas, thus, this variation is not reflected in these simulations.

The index reservoir scenario does not consider tile drainage. Areas that are prone to substantial runoff are often tile drained. This may underestimate exposure, particularly on a chronic basis (the watershed on which the IR is based had no documented tile drainage). Additionally, EXAMS is unable to easily model spring and fall turnover which would result in complete mixing of a chemical through the water column during these events. Because of this inability, Shipman City Lake has been simulated without stratification. There is data to suggest that Shipman City Lake does stratify in the deepest parts of the lake at least in some years. This may result in both an over and underestimation of the concentration in drinking water depending upon the time of the year and the depth the drinking water intake is drawing from. A full description of the Index Reservoir is provided in the "*Guidance for Use of the Index Reservoir in Drinking Water Exposure Assessment"* from EFED upon request.

Development a Percent Crop Area (PCA), watershed-based adjustment factor for the percent of land in production for a specific crop, for Cherry/stone fruits has not been performed. The SAP recommended against the use of the PCA for 'minor' crops because it believed that the scale of the watershed size used to develop the PCA (8-digit HUC) was too large to capture each drinking water watershed and the resulting PCAs would likely be highly inaccurate and not conservative (for the purpose of PCA development, cherry/stone fruits can be considered a minor crop). In the absence of a crop specific PCA, a default PCA of 0.87 is currently being used.

3.0 Scenario description

The field used to grow stone fruits is located in Fresno County, California. The soil is Exeter fine sandy loam - Fine-loamy, mixed, superactive Typic Durixeralf in MLRA 17. The series is characterized as a Hydrologic Group C soil.

4.0 Modeling Inputs and Results

The weather, agricultural practices, and ziram applications were simulated over 36 years so that the ten year excedence probability at the site could be estimated. The EDWC's generated in this analysis were estimated using PRZM 3.12 (Pesticide Root Zone Model) for simulating runoff and erosion from the agricultural field and EXAMS 2.97.5 (Exposure Analysis Modeling System) for estimating environmental fate and transport in surface water. Table 2 summarizes the input values used in the model run for PRZM/EXAMS. Attached to this memo is a copy of the printout generated from the PRZM/EXAMS run.

Table 2. PRZM/EXAM Input Parameters for Ziram

Parameters	Values & Units	Sources
PC Code	034805	N/A
Molecular Weight	307.5 g $Mole^{-1}$	MRID 442284-01
Vapor Pressure	Negligible (Torr)	Agrochemical Handbook, 3rd Ed.¶
Water Solubility	65 mg L^{-1}	Product Chemistry Data
Hydrolysis Half-Life (pH 7)	0.74 days	MRID 43866701
Aerobic Soil Metabolism $t_{½}$, (3X the available value)	5.25 day	MRID 43985801
Bacterial biolysis in water column	Stable (days)	As per current EFED-ERB Guidelines
Bacterial biolysis in benthic sediment	Stable (days)	As per current EFED-ERB Guidelines
Direct Aqueous Photolysis	0.363 days	MRID 44097701
Soil Water Partition Coefficient	5.7 L Kg^{-1}	MRID 43873501
Pesticide is Wetted-In	No	Product Label
Crop Western Stone Fruits	Fruit cycle Dormant	As per current EFED-ERB Guidelines
Pesticide application rate (lb a.i./A)	7.5 and 6.08	SRRD Provided
Application Frequency	2 and 7	SRRD Provided
Application interval (days)	60 and 3	SRRD Provided
Application Method	Aerial	Product Label
PCA	0.87	Default Value

¶ Kidd, H, and James, D.R. (Editors). 1991. The Agrochemicals Handbook. 3rd Edition. Royal Society of Chemistry Information Services, Cambridge, U.K.

Chemical: Ziram
PRZM environment: CAFrt2.inp (Fruit Cycle)
EXAMS environment: INDEXRES.EXV
Metfile: met17.met

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1948	65.360	32.260	20.300	7.562	5.041	1.720
1949	72.340	35.580	22.030	8.351	5.567	1.852
1950	113.000	37.830	23.390	8.706	5.804	1.973
1951	107.000	36.090	25.390	9.597	6.398	2.237
1952	113.000	37.990	24.090	8.771	5.847	1.983
1953	109.000	36.670	24.010	9.066	6.044	2.102
1954	62.640	35.000	21.000	8.314	5.542	1.941
1955	109.000	36.770	26.800	9.969	6.646	2.271
1956	104.000	34.630	25.600	9.556	6.370	2.213
1957	109.000	36.760	26.240	9.831	6.554	2.264
1958	62.520	35.070	18.920	7.073	4.715	1.612
1959	95.990	35.720	24.850	9.581	6.387	2.206
1960	104.000	35.410	25.270	9.651	6.434	2.206
1961	111.000	37.420	24.650	9.322	6.215	2.130
1962	67.800	34.630	24.230	9.395	6.263	2.246
1963	59.220	32.010	22.860	8.638	5.759	2.089
1964	61.460	33.820	20.800	8.368	5.579	1.971
1965	106.000	35.810	24.040	8.658	5.772	2.033
1966	106.000	35.820	26.160	9.782	6.521	2.282
1967	108.000	36.450	21.730	8.373	5.582	1.823
1968	104.000	35.000	24.410	9.324	6.216	2.055
1969	68.090	34.530	24.170	9.179	6.119	2.201
1970	103.000	34.360	26.900	10.080	6.719	2.278
1971	107.000	36.340	26.890	10.040	6.693	2.275
1972	109.000	36.710	26.360	10.020	6.680	2.254
1973	78.610	39.970	22.660	8.537	5.692	1.946
1974	72.910	38.270	19.400	7.679	5.120	1.680
1975	113.000	37.920	24.730	9.200	6.133	2.049
1976	102.000	34.870	24.810	9.386	6.257	2.180
1977	108.000	36.460	24.860	9.354	6.236	2.243
1978	95.290	37.050	21.540	8.305	5.536	1.842
1979	61.910	25.920	18.740	7.389	4.926	1.640
1980	71.580	36.080	21.540	8.517	5.678	2.018
1981	45.830	23.310	16.640	6.694	4.463	1.529
1982	114.000	37.900	22.490	8.242	5.494	1.765
1983	76.610	38.170	19.070	7.628	5.085	1.750

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
0.027	114.000	39.970	26.900	10.080	6.719	2.282
0.054	113.000	38.270	26.890	10.040	6.693	2.278
0.081	113.000	38.170	26.800	10.020	6.680	2.275
0.108	113.000	37.990	26.360	9.969	6.646	2.271
0.135	111.000	37.920	26.240	9.831	6.554	2.264

0.162	109.000	37.900	26.160	9.782	6.521	2.254
0.189	109.000	37.830	25.600	9.651	6.434	2.246
0.216	109.000	37.420	25.390	9.597	6.398	2.243
0.243	109.000	37.050	25.270	9.581	6.387	2.237
0.270	108.000	36.770	24.860	9.556	6.370	2.213
0.297	108.000	36.760	24.850	9.395	6.263	2.206
0.324	107.000	36.710	24.810	9.386	6.257	2.206
0.351	107.000	36.670	24.730	9.354	6.236	2.201
0.378	106.000	36.460	24.650	9.324	6.216	2.180
0.405	106.000	36.450	24.410	9.322	6.215	2.130
0.432	104.000	36.340	24.230	9.200	6.133	2.102
0.459	104.000	36.090	24.170	9.179	6.119	2.089
0.486	104.000	36.080	24.090	9.066	6.044	2.055
0.514	103.000	35.820	24.040	8.771	5.847	2.049
0.541	102.000	35.810	24.010	8.706	5.804	2.033
0.568	95.990	35.720	23.390	8.658	5.772	2.018
0.595	95.290	35.580	22.860	8.638	5.759	1.983
0.622	78.610	35.410	22.660	8.537	5.692	1.973
0.649	76.610	35.070	22.490	8.517	5.678	1.971
0.676	72.910	35.000	22.030	8.373	5.582	1.946
0.703	72.340	35.000	21.730	8.368	5.579	1.941
0.730	71.580	34.870	21.540	8.351	5.567	1.852
0.757	68.090	34.630	21.540	8.314	5.542	1.842
0.784	67.800	34.630	21.000	8.305	5.536	1.823
0.811	65.360	34.530	20.800	8.242	5.494	1.765
0.838	62.640	34.360	20.300	7.679	5.120	1.750
0.865	62.520	33.820	19.400	7.628	5.085	1.720
0.892	61.910	32.260	19.070	7.562	5.041	1.680
0.919	61.460	32.010	18.920	7.389	4.926	1.640
0.946	59.220	25.920	18.740	7.073	4.715	1.612
0.973	45.830	23.310	16.640	6.694	4.463	1.529
1/10	113.000	38.044	26.492	9.984	6.656	2.272

MEAN OF ANNUAL VALUES = 2.024

STANDARD DEVIATION OF ANNUAL VALUES = 0.222

UPPER 90% CONFIDENCE LIMIT ON MEAN = 2.079

EEC calculations:

Acute EEC = (1/10 peak value)(Percent crop area factor[§])
= (113.0 :g/L)(0.87) = 98.31 :g/L

Non-cancer Chronic EEC =(1/10 yearly value)(Percent crop area factor)
(2.272 :g/L)(0.87)= 1.98 :g/L

Cancer chronic EEC = (Mean of annual value)(Percent crop area factor)
(2.024 :g/L)(0.87)= 1.76 :g/L

§ = Default PCA value
Chemical: Ziram
PRZM environment: CAFrt1.inp (60-Days DORMENT)

EXAMS environment: INDEXRES.EXV
Metfile: met17.met

WATER COLUMN DISSOLVED CONCENTRATION (PPB)

YEAR	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
1948	49.150	13.600	4.391	1.624	1.706	0.521
1949	49.150	16.870	4.080	1.480	1.611	0.486
1950	49.150	22.700	5.318	1.880	1.873	0.628
1951	49.150	13.600	4.268	1.531	1.640	0.494
1952	49.150	13.600	3.201	1.156	1.398	0.411
1953	82.060	22.500	5.582	2.022	1.970	0.591
1954	49.150	20.200	4.878	1.736	1.783	0.562
1955	49.150	19.830	4.945	1.769	1.807	0.567
1956	49.150	22.130	5.009	1.789	1.817	0.608
1957	49.150	14.640	4.675	1.660	1.724	0.530
1958	49.150	20.250	4.607	1.682	1.744	0.581
1959	49.150	15.200	4.776	1.762	1.798	0.552
1960	49.150	13.600	4.152	1.469	1.607	0.488
1961	49.150	17.100	4.093	1.498	1.629	0.525
1962	49.150	23.610	5.258	1.868	1.863	0.628
1963	49.150	14.710	4.649	1.700	1.762	0.540
1964	49.150	13.600	4.053	1.487	1.612	0.488
1965	49.150	19.790	4.527	1.670	1.742	0.545
1966	49.150	13.600	4.497	1.649	1.725	0.522
1967	96.950	26.590	6.104	2.173	2.074	0.630
1968	49.150	21.930	4.659	1.701	1.767	0.593
1969	49.150	13.600	4.345	1.534	1.641	0.502
1970	49.150	13.600	3.455	1.266	1.465	0.439
1971	49.150	13.600	4.255	1.555	1.663	0.502
1972	49.150	19.560	4.903	1.798	1.824	0.569
1973	49.150	13.600	2.745	0.986	1.289	0.384
1974	49.150	13.600	3.323	1.203	1.420	0.421
1975	49.150	22.580	5.033	1.849	1.856	0.614
1976	49.150	13.600	3.677	1.364	1.540	0.459
1977	49.150	14.740	4.658	1.691	1.753	0.535
1978	49.150	13.600	3.028	1.097	1.355	0.404
1979	75.630	20.740	4.957	1.753	1.791	0.540
1980	49.150	13.600	3.294	1.173	1.407	0.424
1981	49.150	13.600	2.817	1.062	1.331	0.396
1982	49.150	13.600	2.649	0.978	1.270	0.383
1983	49.150	13.600	2.969	1.098	1.355	0.409

SORTED FOR PLOTTING

PROB	PEAK	96 HOUR	21 DAY	60 DAY	90 DAY	YEARLY
0.027	96.950	26.590	6.104	2.173	2.074	0.630
0.054	82.060	23.610	5.582	2.022	1.970	0.628
0.081	75.630	22.700	5.318	1.880	1.873	0.628
0.108	49.150	22.580	5.258	1.868	1.863	0.614
0.135	49.150	22.500	5.033	1.849	1.856	0.608
0.162	49.150	22.130	5.009	1.798	1.824	0.593
0.189	49.150	21.930	4.957	1.789	1.817	0.591
0.216	49.150	20.740	4.945	1.769	1.807	0.581

0.243	49.150	20.250	4.903	1.762	1.798	0.569
0.270	49.150	20.200	4.878	1.753	1.791	0.567
0.297	49.150	19.830	4.776	1.736	1.783	0.562
0.324	49.150	19.790	4.675	1.701	1.767	0.552
0.351	49.150	19.560	4.659	1.700	1.762	0.545
0.378	49.150	17.100	4.658	1.691	1.753	0.540
0.405	49.150	16.870	4.649	1.682	1.744	0.540
0.432	49.150	15.200	4.607	1.670	1.742	0.535
0.459	49.150	14.740	4.527	1.660	1.725	0.530
0.486	49.150	14.710	4.497	1.649	1.724	0.525
0.514	49.150	14.640	4.391	1.624	1.706	0.522
0.541	49.150	13.600	4.345	1.555	1.663	0.521
0.568	49.150	13.600	4.268	1.534	1.641	0.502
0.595	49.150	13.600	4.255	1.531	1.640	0.502
0.622	49.150	13.600	4.152	1.498	1.629	0.494
0.649	49.150	13.600	4.093	1.487	1.612	0.488
0.676	49.150	13.600	4.080	1.480	1.611	0.488
0.703	49.150	13.600	4.053	1.469	1.607	0.486
0.730	49.150	13.600	3.677	1.364	1.540	0.459
0.757	49.150	13.600	3.455	1.266	1.465	0.439
0.784	49.150	13.600	3.323	1.203	1.420	0.424
0.811	49.150	13.600	3.294	1.173	1.407	0.421
0.838	49.150	13.600	3.201	1.156	1.398	0.411
0.865	49.150	13.600	3.028	1.098	1.355	0.409
0.892	49.150	13.600	2.969	1.097	1.355	0.404
0.919	49.150	13.600	2.817	1.062	1.331	0.396
0.946	49.150	13.600	2.745	0.986	1.289	0.384
0.973	49.150	13.600	2.649	0.978	1.270	0.383
1/10	57.094	22.616	5.276	1.872	1.866	0.618

MEAN OF ANNUAL VALUES = 0.513
STANDARD DEVIATION OF ANNUAL VALUES = 0.075
UPPER 90% CONFIDENCE LIMIT ON MEAN = 0.532

EEC calculations:

Acute EEC = (1/10 peak value)(Percent crop area factor[§])
= (57.09 :g/L)(0.87) = 49.67 :g/L

Non-cancer Chronic EEC =(1/10 yearly value)(Percent crop area factor)
(0.618 :g/L)(0.87)=0.54 :g/L

Cancer chronic EEC = (Mean of annual value)(Percent crop area factor)
(0.513 :g/L)(0.87)=0.45 :g/L

§ = Default PCA value